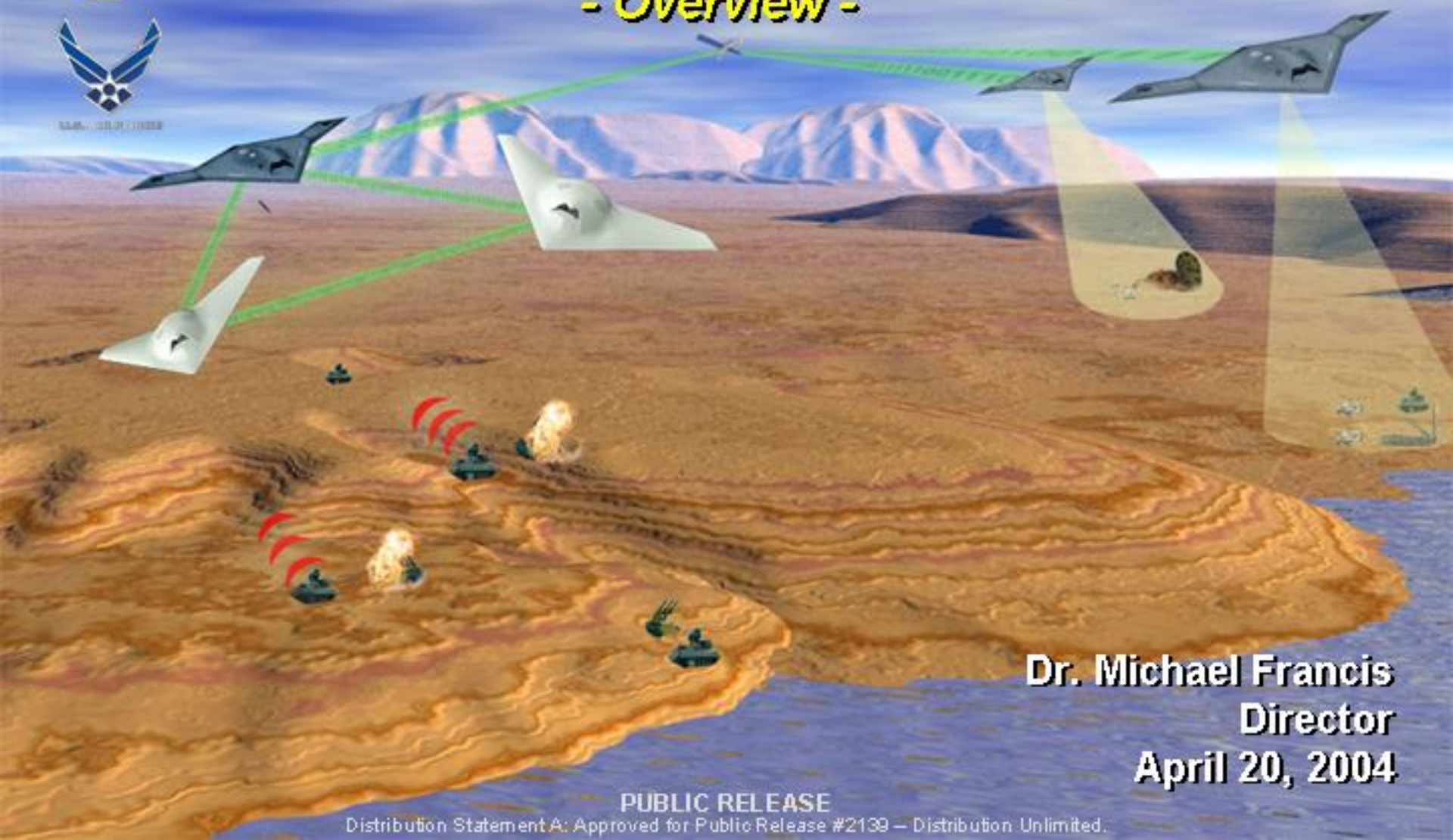




Joint Unmanned Combat Air Systems Capability Demonstration Program

- Overview -



Dr. Michael Francis
Director
April 20, 2004

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Purpose



- **Acquaint You with the J-UCAS Program**
- **Describe the *Common Operating System (COS)* and Our Plan to Develop It**
- **Describe the Integrator/Broker Role in COS Development**
- **Discuss Potential Technology Contribution Opportunities**



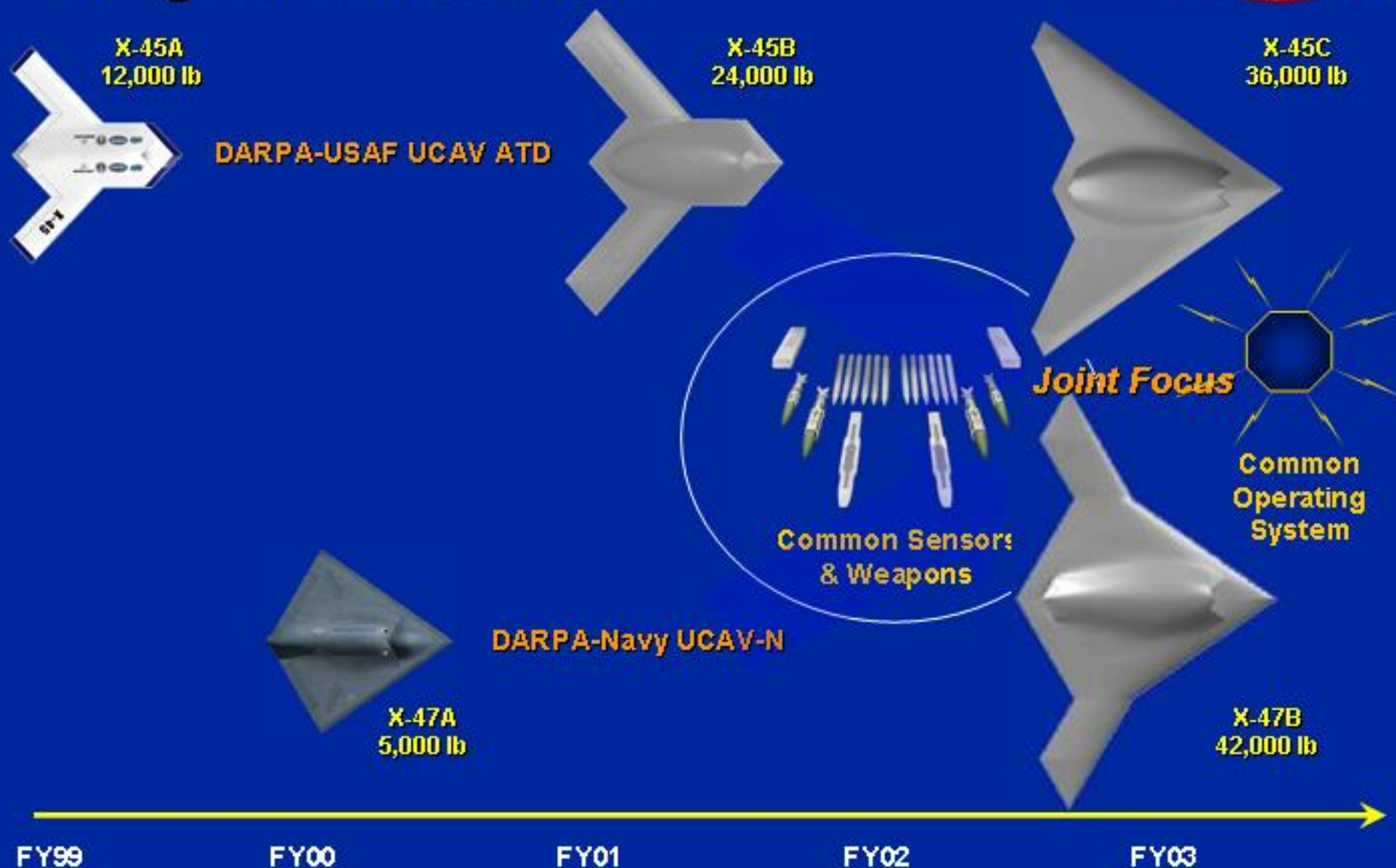
Joint Unmanned Combat Air Systems -- Unique Joint Program

- **DARPA-Air Force-Navy Joint Development Program**
 - Effective 1 Oct 2003 ... Program Office in Arlington, VA
- **Outgrowth of Earlier DARPA Programs**
 - Uninhabited Tactical Aircraft (UTA) – 1994-1996
 - DARPA-USAF Unmanned Combat Air Vehicle (UCAV) – 1997-2003
 - DARPA-Navy Unmanned Combat Air Vehicle (UCAV-N) – 2000-2003
- **Network-based System-of-Systems**
 - Focus on Operational Capabilities ... Specific Mission Applications
 - 2 Prime Contractors -- Boeing (X-45), Northrop Grumman (X-47)
- **Atypical Program Architecture**
 - Spiral Development ... Cutting Edge Technologies ... ATDs
 - Operational Assessment ... Exploration/Demonstration of Capabilities
 - Aggressive Timeline ... FY07 for Start of the “OA”
- **Large Program - \$4B+ over the FYDP**

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Program Evolution



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J-UCAS Capability Demonstration Program -- *The Vision*



SEAD/Electronic Attack



Surveillance



Deep Strike



- **Versatile Combat Capability**

- Multi-Mission Adaptability
- Global Operations

- **Manned Force Augmenter**

- Unique, Difficult Missions
- Operational Synergy
- Force Amplification

- **Network-Centric Operations**

- Network-based Architecture
- Multi-Vehicle Collaboration
- High Levels of Autonomy
- Flexible Human Intervention
- Enhanced Situation Awareness
- Dynamically Adaptive System
- Predictable Battlefield Effects
- ... Unpredictable Tactics

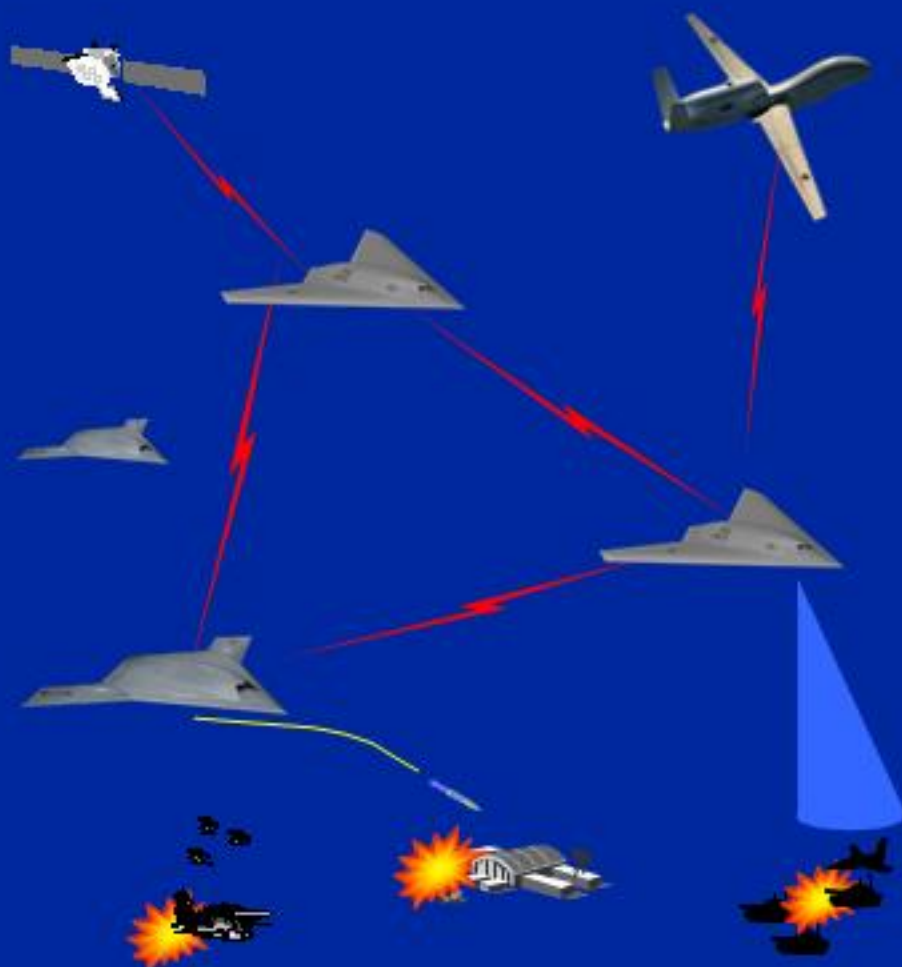
- **Affordable System-of-Systems**

- Common Operating System
- Air Vehicle Compatibility
- Reduced Support Costs

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Collaborative Operations



Increase System Versatility

- Deep/Denied Environments
- System-of-Systems Threats
- Multiple Engagement Options
- Diverse Missions

Improve System Performance

- Reduced Target Location Time
- More Assured Target Identification
- Sustained Ground Tracking
- Improved Targeting Precision
- Rapid Battle Damage Assessment

Enhance Survivability

- Group Self Defense Tactics
- Novel CONOPS (e.g. Bi-static Ops)
- Graceful System Degradation

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Global Capabilities— SPACE AS INFRASTRUCTURE

Navigation

“Reach Forward –
Reach Back”

Communications

- Remote Sensing (Collaborative)
- Missile Warning

Theater C2

Global Operations

- Airspace Deconfliction
- Large # of Platforms
- Coordinated C2-ISR
- Near Real Time

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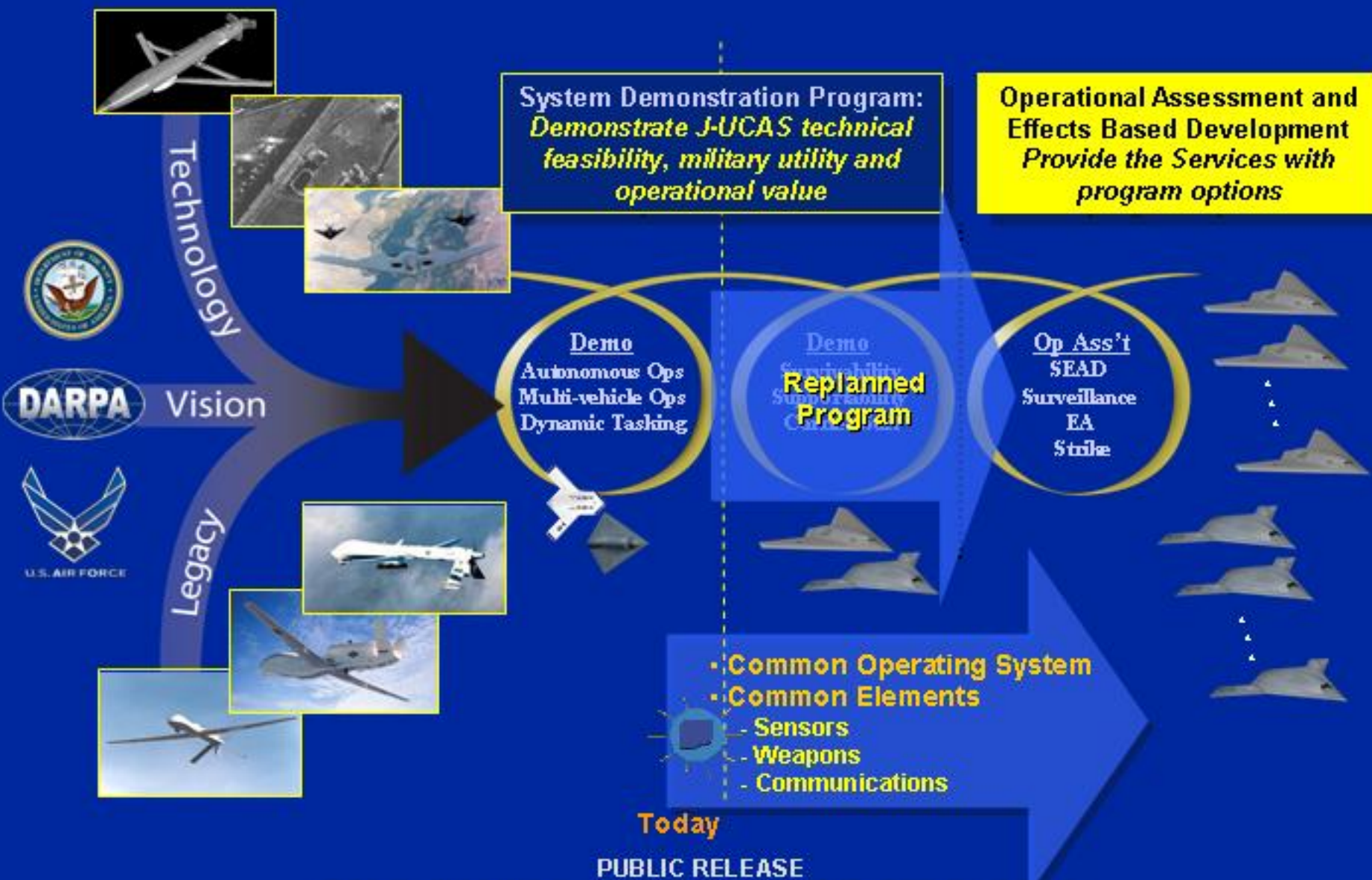
Program Direction & Expectations

- **OSD Objectives (23 Jun 03 USD/AT&L Memorandum)**
 - Demonstrate Feasibility & Flexibility Of The J-UCAS Concept
 - Conduct Joint Operational Assessment Of J-UCAS Capabilities
 - **OA In FY07-09 Timeframe ... Facilitate Early Service Decision**
 - Maintain Competitive Environment Throughout The Program
- **Service OA Expectations (OA Capability Statements)**
 - Diverse Mission Priorities
 - **USAF – SEAD / Electronic Attack**
 - **Navy – Persistent Surveillance / Reconnaissance (Deferred)**
 - Demanding Air Vehicle Characteristics
 - **Range / Radius / Endurance**
 - **Payload Options – Type / Weight / Volume**
 - **Signature – LO To The Next Level**
 - **Air Refueling**
 - **Carrier Suitability (Navy)**

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J-UCAS Program



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Successful 1st Generation Air Vehicles



X-45A Guided Weapons Drop



X-47A First Flight



- **X-45A Accomplishments**

- First Flight – May 02
- Max Altitude / Max Speed – Feb 03
- Multi-Vehicle Ground Tests – Feb 04
- Guided Weapons Release Demonstration Apr 04

- **Software Develops Critical J-UCAS Functionality**

- Vehicle Decision Making
- Multi-Vehicle Collaboration

- **X-47A Accomplishments**

- First Flight – May 03
- Low Speed Aerodynamics & Flying Qualities
- Carrier Landing Systems Compatibility

- **Design Leverages Global Hawk And Fire Scout Experience**

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Toward Operational Air Vehicles



Boeing X-45C



Northrop Grumman X-47B

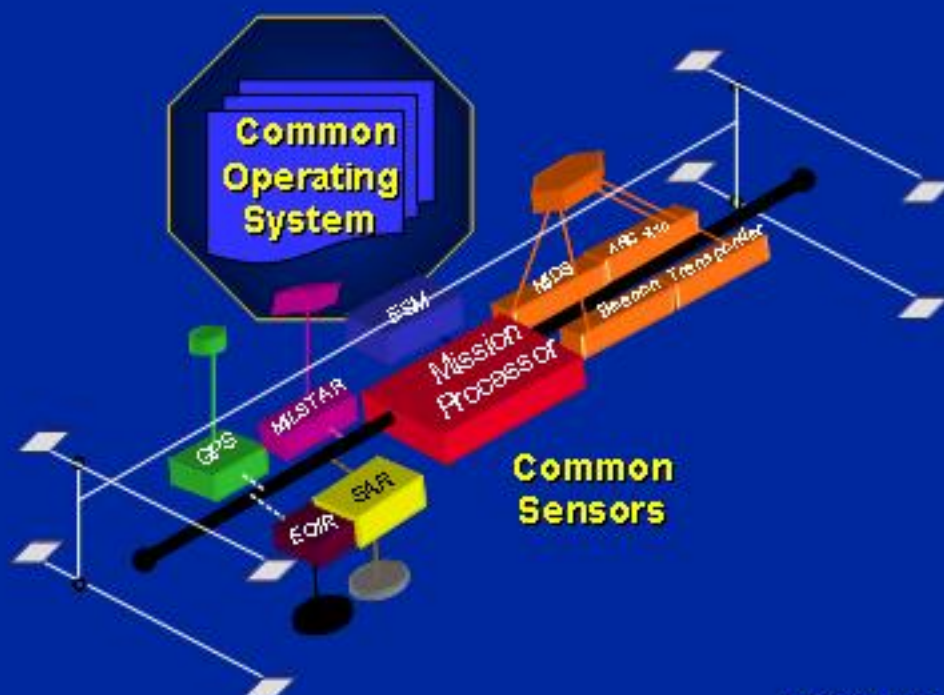
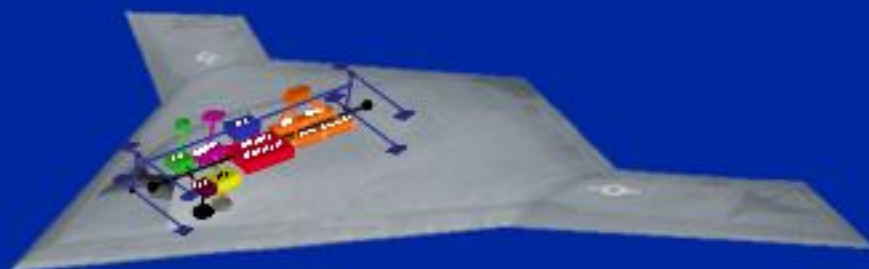
Challenging Objectives

- **Long Range – Combat Radius**
 - 1300 nm with 4500 lb Payload
- **Significant Endurance/Persistence**
 - Demo System: 1000 nm / 2 hrs loiter
 - Objective System: 1000 nm / 3.5 hrs loiter
- **Sizable Payload**
 - Size / Volume & Weight - 4000# - 2 JDAMs
 - Multiple Weapons / Sensor Pallets
- **High Platform Survivability**
- **Versatile Sensor Suite**
 - ESM Capability
 - Synthetic Aperture Radar
 - EO / IR Sensor
 - EW / Electronic Attack Payload
- **Carrier Suitability**
 - Catapult Launch
 - Arrested, 3rd Wire Landing
- **Global Operations**
 - Air Refuelable
 - Civil Airspace Compatible

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Common Systems & Technologies



- **Common Operating System**
- **Communications Capability**
- **Sensors**
- **Weapons**
- **Avionics Hardware (e.g. Processors)**

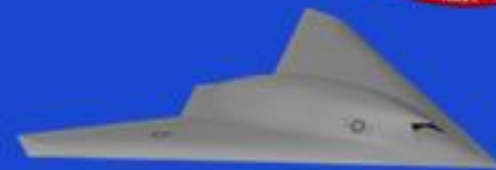
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J-UCAS System Elements

Operational Infrastructure

- Communications Relay
- Navigation
- Sustainment
- Transport



Platform/Vehicle(s)

- Mission-Tailored Design
- Vehicle Management
- Vehicle Autonomous Functions

Communications

- Secure Links/Network
- LOS or BLOS Ops



Control Station(s)

- Physical HSI (Displays, I/O, ...)
- Launch/Recovery Control
- Vehicle-Payload Operations
- Human Crew

Operating System

- System C2 & Interfaces
- Comms Management
- Mission Planning
- Autonomous Functions
- Health/Status
- Logical HSI ...

Direct Support

- Maintenance
- Logistics
- Launch/Recovery Infrastructure



Payload Systems

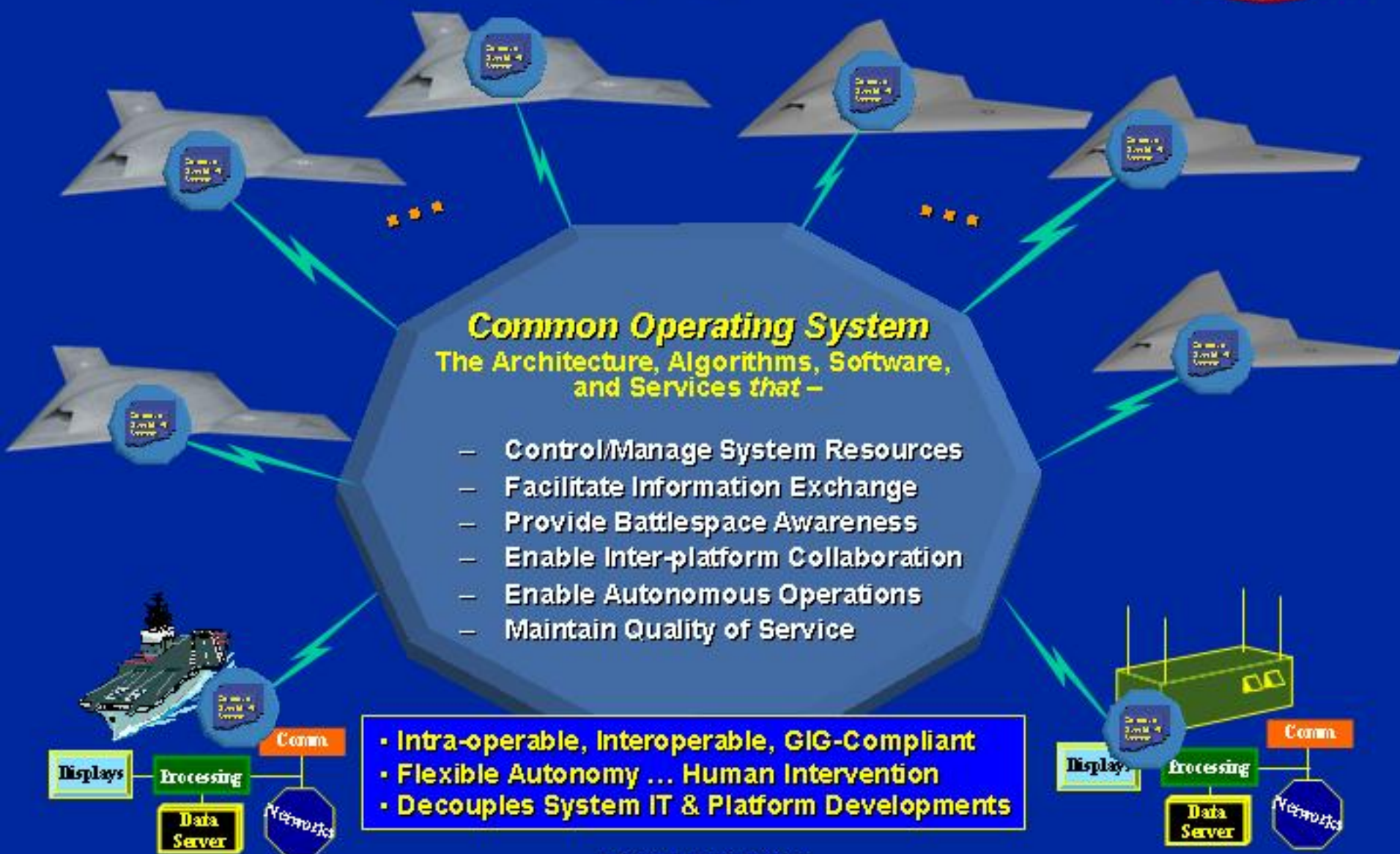
- Sensor(s)
- On-Board Processing
- Data Relay
- Weapons



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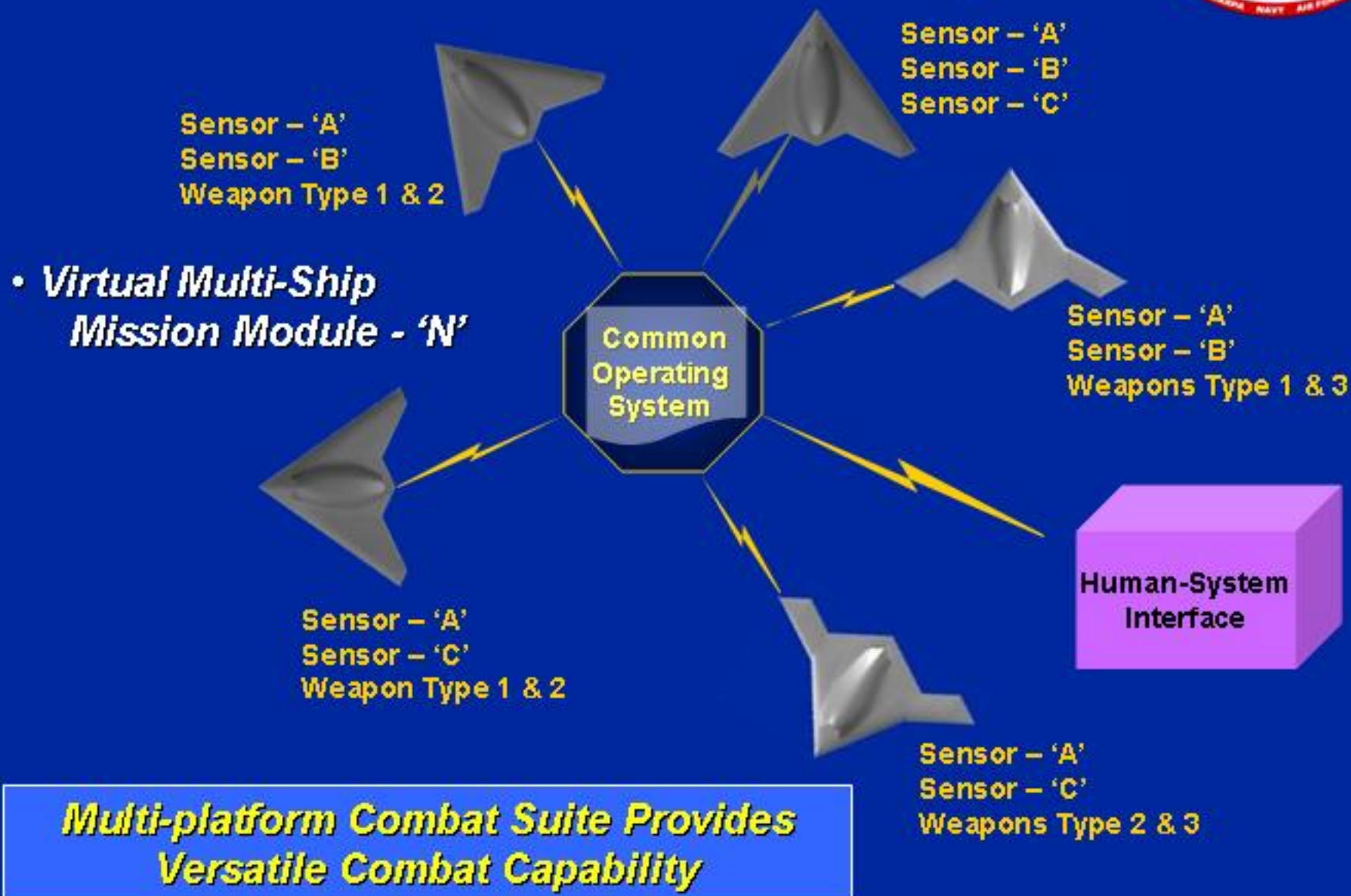
Common Operating System



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Joint Unmanned Combat Air System



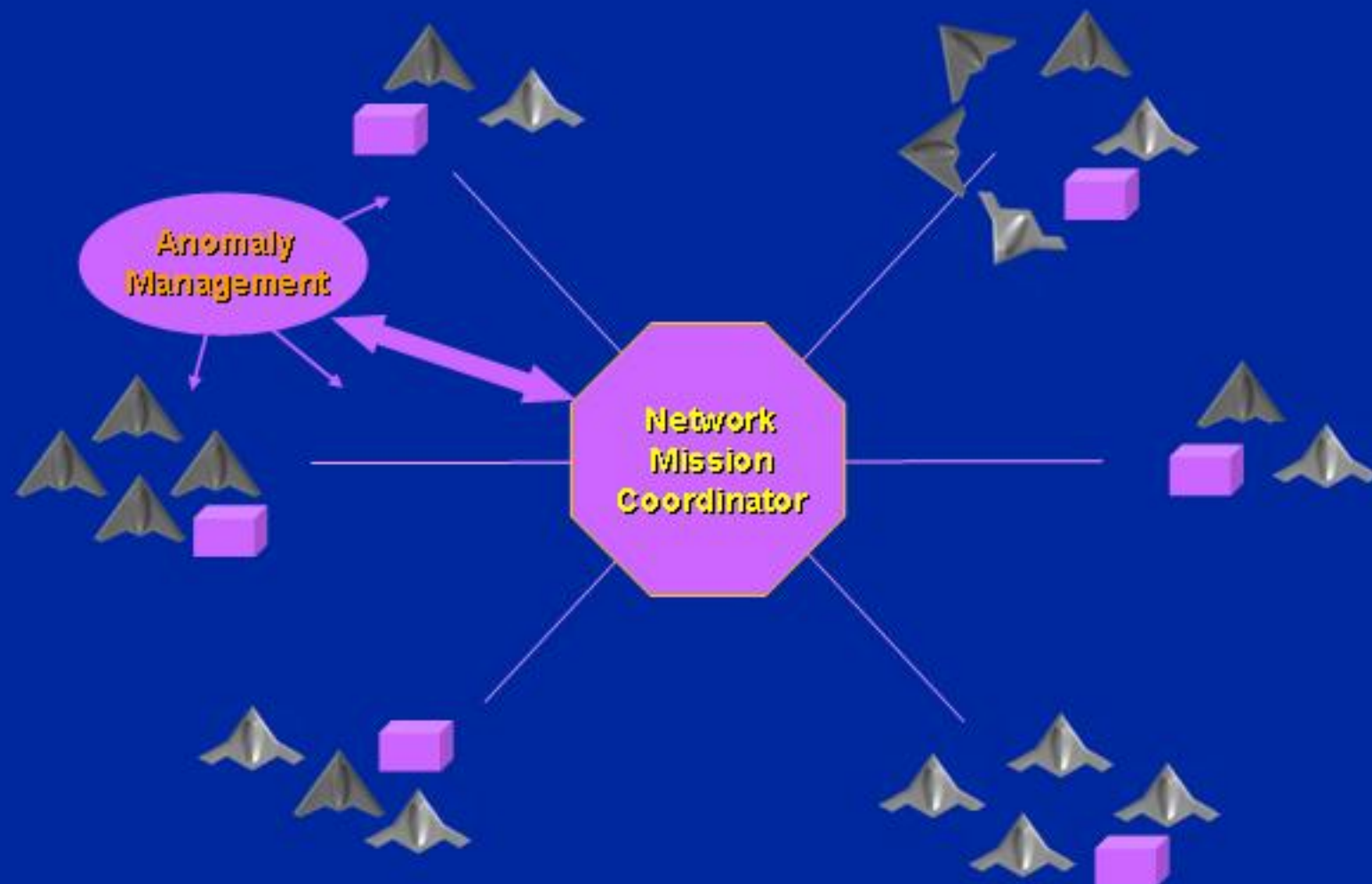
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Joint Unmanned Combat Air System



New CONOPs and Tactics Possible ...



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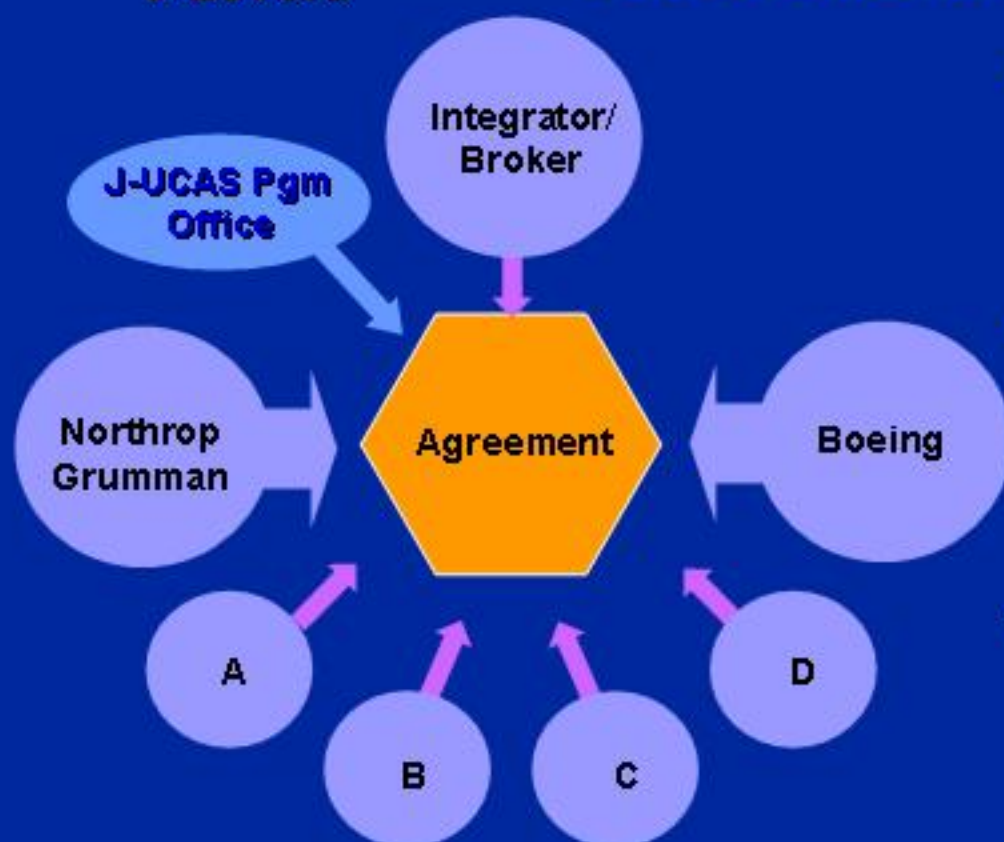
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Common Operating System



3 Levels

Consortium-like Business Arrangement



• Integrator/Broker/Observer

Unique Role ... Not an LSI ... No Other Integrator ... Facilitator ... Referee
No Intellectual Property

• Program Primes – Key Stakeholders

Fractional Ownership
Platform Integrators – Physical, Functional
S/W Developers
COS Collaborators

• Other Contributors

Based on Potential Contribution(s)
Small Houses, Other Primes, Traditional Subs, Commercial Providers

**Business dynamics promote competition & ownership ...
Increased idea pool decreases technology risk**

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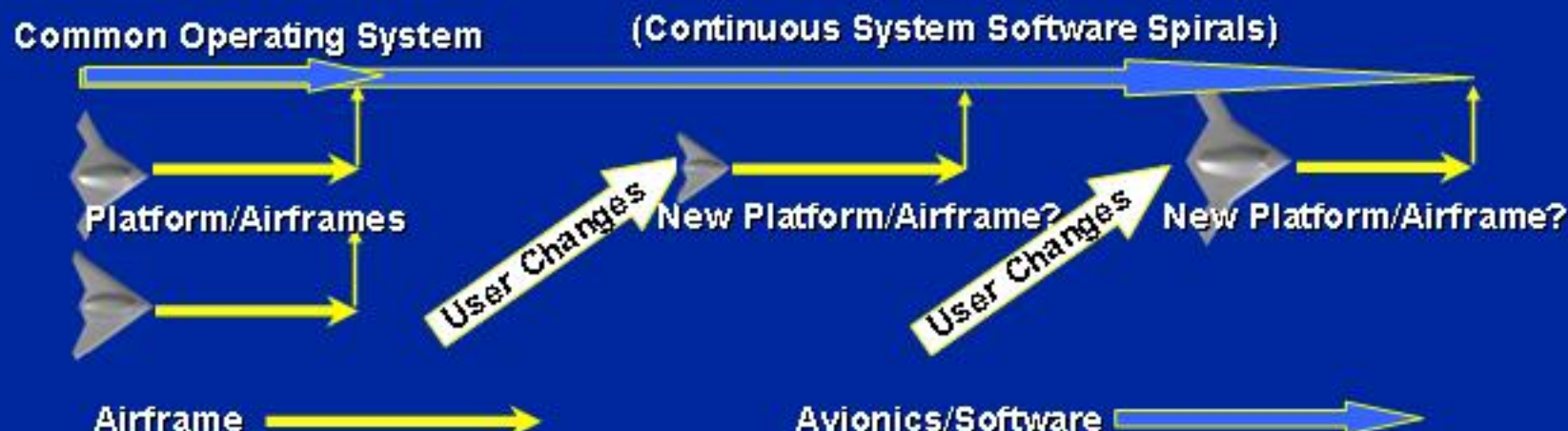
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Decoupling the Operating System

Traditional System Development



J-UCAS System Development Concept



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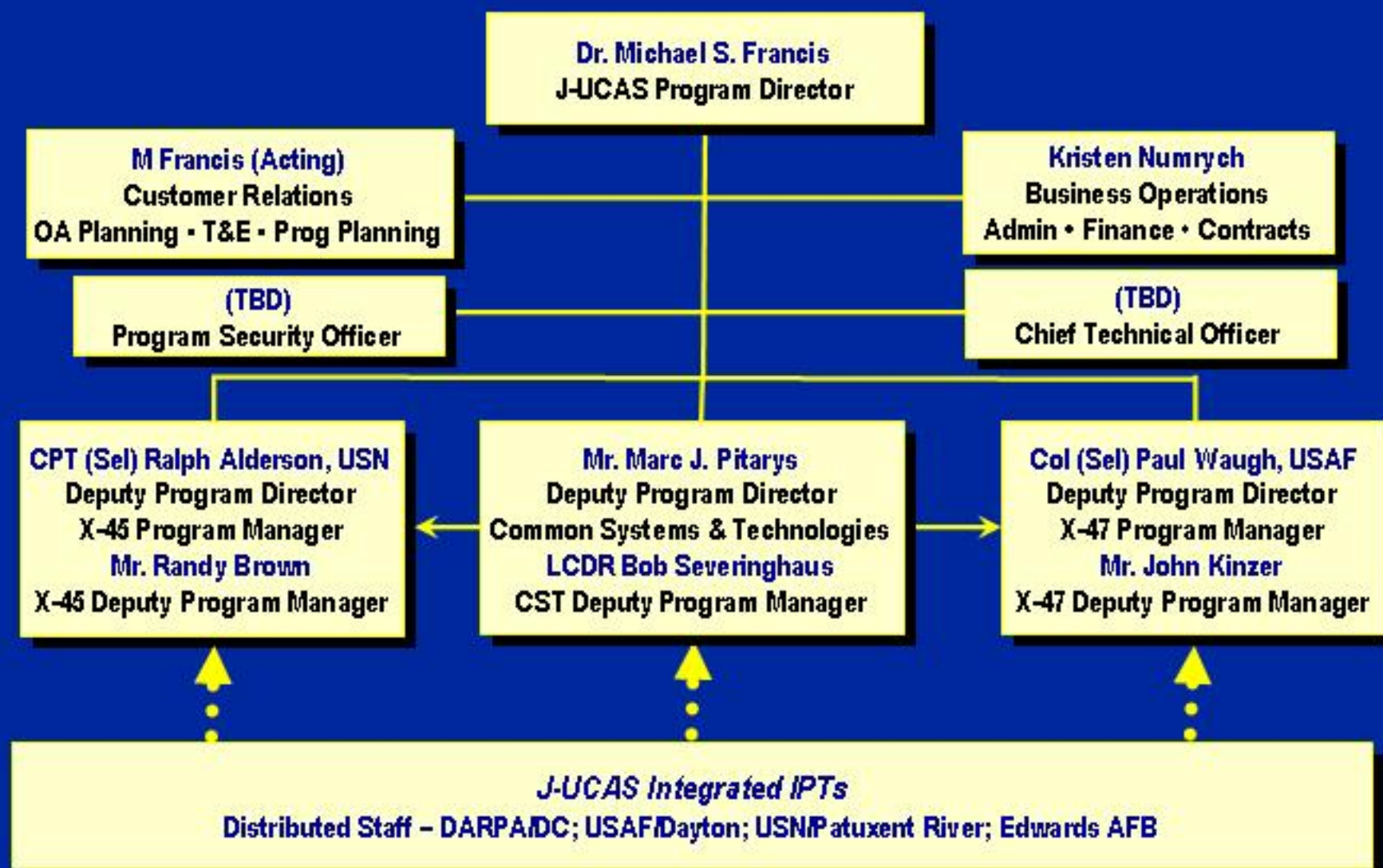
Challenges



- **Significant Technical Hurdles ... Demanding Schedule**
 - Achieving Integrated System Performance and Capabilities
 - Complex, State-of-the-Art Air Vehicles
 - Operating System Flexibility and Versatility ... Including the Human Element
 - Taking Full Advantage of the Technologies
 - Understanding & Reducing System Vulnerabilities
- **Overcoming Institutional & Cultural Inertia**
 - Building User Trust in the Systems & Technologies
 - Improve User Willingness to Adapt ... Exploit New Opportunities
 - Integration Into the Global Airspace
- **Maintaining a Focus on Affordability**
 - Resisting Requirements Creep ... Tendency to Increase Size & Complexity
 - Continuous Focus on Cost Issues



J-UCAS Office Structure



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Agenda



Agenda Overview	Mr. Pitarys	0800-0810
J-UCAS Overview	Dr. Francis	0810-0850
Common Systems & Technology Overview & Common Operating System (COS) Overview	Mr. Pitarys	0850-0945
COS Integrator/Broker	Mr. Pitarys	0945-1015
Break	All	1015-1045
Integrator/Broker Solicitation	Mr. Bennington	1045-1130
Questions & Answers	All	1130-1200
Lunch	All	1200-1300
More Questions & Answers	All	1300-1400
Concluding Remarks, Wrap-up And Adjourn	All	1400-1500

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